●www.sciencemag.org
SCIENCE

EDITORIAL

Science and "One Country, Two Systems"

On 1 July 1997, following the handover to China, Hong Kong entered the era of "one country, two systems." An imaginative group in Hong Kong thought that scientists might have something relevant to say. The notion was not entirely fanciful. Scientists live with dualities—and struggle against them.

Probably one of the most revolutionary innovations in science during this century was the recognition of the duality of matter; that is, in some aspects of its behavior matter is best described as a particle, and in other aspects as a wave. This revolution in scientific thought took place almost three-quarters of a century ago. By now most scientists have come to accept it. But, happily for science, there are still some who are convinced that they can uncover a deeper level of truth in which the coexisting systems of thought will be replaced by a unified view.

Those who resist this revolution in science are not regarded as a threat. They are not branded as counterrevolutionary. There is a good reason for this. Stated simply, it is that if change marks a step forward on, say, 1 July 1997, then change can once again represent progress at some future date.

The concept of "one matter, two descriptions" introduced in the 1920s represented a major advance. But it constitutes no more than a step along the path toward greater understanding. The door remains open to further discoveries.

Politics, which addresses the complex problem of reconciling human aspirations, is also a process of discovery. Under democracy, each new orthodoxy has its opportunity to persuade the people and, later, to be modified by them.

There are, it should be recognized, many forms of democratic organization. Science constitutes one. It is a subtle structure in which, without formal elections, the dominant views establish themselves in forums organized to give a hearing to dissent. These views prevail because of their power to persuade, and not because of the power of those who hold them.

Every issue of a scientific journal, every scientific conference, and every informal meeting between scientists is devoted to testing current orthodoxy in order to see whether it can be improved. Science is a stumbling progress toward change.

But it is not enough to say that science is open to change; it is necessary to work to ensure it. In science, as in politics, those in authority have an interest in the current orthodoxy. Left to themselves, it is altogether conceivable that the scientific leadership, like the political leadership, might place obstacles in the path of change.

The democratic structure in science prevents this. As scientists we are required to defend our views in public. There are many ways of structuring a democratic system, but there is no way of sustaining one without vigilance to ensure that minority views are heard. Not only does the color of a cat not determine its ability to catch mice, as Deng Xiaoping famously remarked, neither does its politics. Views must be heard in order to be judged.

There is an area of endeavor in which agreement exists as to the need for intellectual freedom. I am thinking of commerce, in which the guiding principle is the "free market."

The market clearly embodies democracy. The individual with an idea is free to interest others in it. Those in favor vote by way of a ballot box called a cash register. The virtue of the system is that it harnesses individual imagination by permitting dissent (called competition), thus leaving the way open to change.

To the outside observer, science presents the same scene of waste as does commerce. But having wrong ideas, as we often do, is a necessary part of the process of having right ones. Science, like commerce, is an organic process in which the interaction of the parts must be permitted to produce unpredictable outcomes. If science, or commerce, or politics, is to flourish, we must build into them sufficient freedom that they can surprise us.

As scientists we share the belief that freedom of thought and expression are vital to achieving new insights. "One country, two systems" is a slogan we can embrace if it becomes an invitation to openness and tolerance.

John Polanyi

The author is a Nobel laureate and a professor of chemistry at the University of Toronto. This editorial is based on his address at an international gathering of Nobel and other prize winners, "Great Science Under One Country, Two Systems," at the City University of Hong Kong on 4 July 1997. A fuller version of this text appeared in the *South China Morning Post* on the day of the presentation.